

**Docket No. SA-537**

**Exhibit No. 2-W**

**NATIONAL TRANSPORTATION SAFETY BOARD**

**Washington, D.C.**

Operations

Excerpts from Asiana Pilot Operations Manual,  
Chapter 2, Supplementary Normal Procedures

(10)

- g. The PF will normally engaging the autopilot with Call out, and the PM also shall engage the auto pilot by the order PF.

*Note) PF must put hands on control wheel and thrust lever in preparation of conducting manual flight after passing final approach fix in auto flight control system mode.*

### 2.1.6.3 Time for Automation Guidelines A/P and A/T

- a. When using the Autopilot and Autothrottle, pilots must adhere to the minimum autopilot engagement and disengagement altitude as stated in the FCOM VOL 1 Limitations.
- b. For the purpose of improvement of manual flight skill, Instructors and Checker can control the time of auto pilot engagement, but it is usually recommended to engage auto pilot at no more than 5,000FT considering traffic in departure phase, restriction altitude and weather etc.

### 2.1.6.4 A/P and A/T Disengage (Disconnect) Procedure

The PF should notify to PM at Auto pilot and/or auto throttle disengagement or disconnection.

*Note) PF should call out "Manual flight" at disconnecting A/P and "A/T Disconnect" at disconnecting A/T. PM must verify changing of relevant FMAs or ASA and then call out the changing..*

	ASA changing	FMA changing	Alert
AP Disconnect	AP→FLT DIR	None	Aural Warning → Siren
A/T Disconnect	None	Blank	Aural Caution → Beeper

*When needed, PF can disconnect A/P and/or A/T by stages. For this, first Push for disconnect then stay momentarily to listen aural warning or Aural Caution then second push for Reset.*

## 2.12 Descent Procedure

### 2.12.1 Preparation for Descent

#### 2.12.1.1 Generals

- a. It is a general rule of descent preparation that the PM carries out upon PF's request after obtaining weather of the destination airport.
- b. Recall and check all EICAS messages by pushing CANC/RCL switch.
- c. Check all note items on ECL.
- d. Weather Radar (User's Manual by Honeywell)
  - 1) During descent, control antenna tilt 1° upward per 10,000ft above 15,000ft altitude and 1° upward per 5,000ft below 15,000 ft
  - 2) During approach, considering terrain condition around an airport and prevent too much clutters from appearing on ND maintain antenna tilt about +4° upward or tilt upward to maintain clutters appear only top portion of ND. At this time, there will be a little difference according to aircraft attitude and gross weight.

#### 2.12.1.2 FMC Set Up

##### a. General

PM will program the FMC for descent and approach, comparing with Route Guide then executes the activation after confirmed by PF.

##### b. Approach REF Page

Enter the VREF speed based on expected landing configuration and landing weight. If this VREF is different from the VREF calculated by FMC at the time of performing approach checklist, change the VREF.

##### c. DEP/ARR Page

Select the expected approach, STAR, TRANSITION on arrival page.

**d. LEGS Page**

Connect all waypoints as required and be sure all discontinuities to be connected. Then input speed/altitude constraints required.

**e. HOLD Page**

Enter required data after verifying the holding procedures depicted on approach charts

**f. NAV RADIO Page**

- 1) Enter required approach data such as ILS frequency/front course, VOR frequency (or identifier) / course, OM or any other available ILS frequency/front course, on the preselect line for reference or in preparation for non-normal condition.

(Ex: 108.9/332, NCN/225)

- 2) In ILS frequency/front course and tune status line, auto tuning is required.

**g. RTE 2 Page**

Input the route from the destination airport to the alternate airport. When the active runway at the alternate airport is known, input appropriate approach procedure and runway so that make that information useful in case of diversion.

## 2.12.9 Considerations

### 2.12.9.1 Descent Speed

Input OFP descent speed in CDU DES page at approach set up and maintain that speed for descent speed (fixed descend speed). However, exceptionally when there is any controller's direction or turbulence condition is expected.

### 2.12.9.2 Descent Path

- a. When flying in LNAV, descent in VNAV is recommended. However, under radar vectors, pilot may descend by using FLCH or V/S mode.

An initial descent from En route to approach or flying by LNAV, using VNAV PATH for descent is recommended.

However, when the flight route is different from the FMC input route, such as an approach under radar vectors, you may modify CDU LEG page for continue using VNAV or descend by using FLCH mode.

- b. Begin descent at TOD with VNAV mode unless ATC restricts.
- c. For the accurate calculation of TOD, wind data may be entered into DESCENT FORECASTS page.
- d. Use [speedbrakes](#) when it is necessary for complying descent profile.

### 2.12.9.3 Descent Constraints

- a. Descent constraints are put into FMC automatically when selecting an arrival procedure.
- b. Set all mandatory altitude constraints in the MCP altitude window to prevent altitude deviation.

### 2.12.9.4 Speed Intervention

Use VNAV speed intervention to respond ATC speed restriction or change.

### 2.12.9.5 Descent Planning

- a. Flight deck workload increases as the aircraft descends to the terminal area. Minimize distractions to assure flight safety.
- b. Descent planning is necessary to arrive at the desired point at a proper speed and configuration.
- c. The distance required for the descent is 3NM / 1000 feet altitude loss for no wind conditions using ECON speed.
- d. A good reference for descent is as follow;
  - 1) To be at 10,000 feet AGL, 30NM from the airport, at 250 knots.
  - 2) When proceeding straight-in approach, plan the descent to arrive at traffic pattern altitude with flaps up maneuvering speed 12NM from the runway.
  - 3) When making an abeam approach, plan the descent to arrive at traffic pattern altitude with flaps up maneuvering speed 8NM from the runway.

### 2.12.9.6 Descent Rate

Descent Rate tables provide rates of descent below 20,000 feet with idle thrust and speedbrakes extended or retracted. Refer to “B777 FCTM”

Target Speed	Rate of Descent (Typical)	
	Clean	With <a href="#">Speedbrake</a>
0.84M / 310 knots	2200 fpm	5300 fpm
250 knots	1400 fpm	3300 fpm
VREF 30 + 80	1000 fpm	2300 fpm

### 2.12.9.7 Use of Speedbrakes

- a. The PF should keep a hand on the speedbrake lever when the speedbrakes are used in-flight.
- b. While using the speedbrakes in descent, allow sufficient altitude and airspeed margin to level off smoothly.
- c. Lower the speedbrakes before thrust increase.
- d. To avoid buffeting, use of speedbrakes with flaps greater than 5 should be avoided.
- e. When condition is required to use speedbrakes with flaps extended, high sink rates during the approach should be avoided.  
Speedbrakes should be retracted before reaching 1,000 feet AGL

## 2.12.10 CDO(Continuous Descent Operations)

### 2.12.10.1 General

CDO is a method by which aircraft approach airport maintaining continuous descent from cruise altitude to IAF (Initial Approach Fix) with no Level flight segment. If CDO procedure is published for the airport, CDO should be performed unless there are restrictions. CDO is recommended if conditions permit even for the airport with no specified CDO procedures for Economical and Comfortable Operations.

*Note) If the CDO procedure is not possible due to an emergency, bad weather conditions, etc, an alternate instruction will be issued by ATC or pilots can request it.*

### 2.12.10.2 FMC set up and Briefing

- a. Set up the designated STAR procedure
- b. Verify and change the ALT/SPD for FMC waypoints
  - 1) IAF (Assigned ALT/ VREF +40)
  - 2) Descent speed on FMC
  - 3) Review the appropriate chart for CDO procedures
  - 4) Compare FMC data with Approach chart (Route and waypoints constraints)

### 2.12.10.3 Recommend procedures

- a. ATC Phraseology
  - 1) Ex: "OZ 221 cleared JINBU 1M arrival, speed and descent at pilot's discretion, report leaving"
  - 2) ATC Phraseology may be changed if necessary
  - 3) Report to ATC when leaving current FL
- b. Recommended Flight Mode
  - 1) Vertical : VNAV PATH(Not VNAV SPD)
  - 2) Lateral : LNAV
  - 3) Using speed on FMC – Not required speed intervention



## 2.18 Visual Approach

### 2.18.1 General

#### 2.18.1.1 Preparations

- a. Check the weather at the destination airport and ensure it has appropriate ceiling and visibility to maintain a visual pattern.
- b. FMC ARRIVAL Page is useful to maintain 2NM downwind width by selecting Runway and RWY EXT.
- c. Usually radar vectored to the airport of downwind leg or final approach and maintain visual reference for landing.

#### 2.18.1.2 Initial/Intermediate Approach

- a. The pilot reports runway in sight or visual reference to ATC then requests visual approach clearance for landing.
- b. Enter maneuvering on downwind leg using HDG/TRK mode when cleared ATC.
- c. Maintain flaps 5 before entering on downwind at Flap 5 maneuvering speed
- d. Refer to FMC and ND for downwind width and base turn point if available.

#### 2.18.1.3 Downwind and Base

- a. Maintain 1,500FT AGL and 2NM according to wind condition on the downwind leg.
- b. Prior to turning base, and 30 seconds past end of the runway extend the landing gear, select flaps 20, arm the speedbrakes, and slow to flaps 20 maneuvering speed.
- c. Approximately 40~45 seconds past end of the runway start base turn with shallow descent rate.
- d. Select landing flaps (flaps 25 or flaps 30) then LANDING CHECKLIST at base.
- e. At turning final, PF orders PM to set the runway heading.
  - 1) PF : “Set Runway Heading”
  - 2) PM : “Runway Heading Set”

#### 2.18.1.4 Final Approach

- a. Recommended approach path approximately 2 1/2~3 degrees.
- b. Adjust the point and bank angles for entering final considering wind direction.
- c. An altitude of approximately 300 feet above airport elevation for each mile from the runway provides a normal approach profile.
- d. Stabilize the airplane on the selected approach speed with an approximate rate of descent between 700–900 FPM. Descent rate greater than 1000 FPM should be avoided. However, little over 1,000FPM is acceptable when heavy gross weight or three VASI condition and it should be included in approach briefing.
- e. Stabilize the plane by 500FT (HAT) on final, Execute “GO-AROUND” if unable to stabilize.
- f. PM should callout “FIVE HUNDRED”, PF should response “LANDING” or “STABILIZED” at 500FT (HAT).

#### 2.18.1.5 Go-Around

- a. Execute missed approach if un-stabilized approach, lost visual reference or ATC directions.
- b. Accomplish normal go-around procedure by maintaining runway heading or ATC instructed heading.

### 2.18.2 CVFP (Charted Visual Flight Procedures)

- a. Some Airport (e.g:SFO) operate CVFP (Charted Visual Approach Procedures) which permit a higher volume of air traffic during good weather conditions and to minimize fuel, reduce flight time.
- b. Pilot may accept clearance for a CVFP in the following circumstances.
  - 1) Remains in a radar environment and has an operating tower.
  - 2) Remains clear of cloud and operate in accordance with the published CVFP procedure and minima.
- c. If followed by another aircraft, the flight crew accepts responsibility for wake turbulence and safe landing separation from the aircraft.
- d. If the crew does not have visual contact with the preceding aircraft, ATC may still clear the CVFP but retains responsibility for both aircraft and wake turbulence separation.

**WARNING**

*If unsatisfied by the above circumstances, pilot should execute Go-Around.*

### 2.18.3 Side Step Maneuver

A visual maneuver accomplished by a pilot at the completion of an instrument approach to permit a straight-in landing on a parallel runway not more than 1,200FT to either side of the runway to which the instrument approach was conducted.

*The end of section*